

Claims

1. A thermotunneling device comprising a collector electrode, an emitter electrode and an insulator layer, wherein the insulator layer is disposed between the emitter electrode and the collector electrode, and is touching the collector electrode.
2. The thermotunneling device of claim 1 in which the insulator layer comprises a metal oxide.
3. The thermotunneling device of claim 2 in which the metal oxide is aluminum oxide.
4. The thermotunneling device of claim 1 in which the distance between the electrodes is in the range of 10 - 200Å.
5. The thermotunneling device of claim 1 in which the distance between the emitter and the insulator layer is in the range of 5 - 50Å.
6. The thermotunneling device of claim 1 in which the emitter electrode comprises a metal.
7. The thermotunneling device of claim 1 in which the collector electrode comprises a metal.
8. A method for enhancing electron tunneling between an emitter and collector electrode comprising the step of contacting the collector electrode with an insulator, and placing the insulator between the collector electrode and the emitter electrode.
9. The method of claim 8 in which the insulator layer comprises a metal oxide.
10. The method of claim 9 in which the metal oxide is aluminum oxide.
11. The method of claim 8 in which said placing step comprises placing the insulator between 5 and 50Å from the emitter electrode
12. The method of claim 8 additionally comprising the step of placing the collector electrode between 10 and 200Å from the emitter electrode.
13. The method of claim 8 in which the emitter electrode comprises a metal.
14. The method of claim 8 in which the collector electrode comprises a metal.
15. A method for cooling comprising the steps:
 - (a) applying a bias voltage to an emitter electrode;

-7-

- (b) placing a collector electrode a distance d_0 from the emitter electrode;
 - (c) placing an insulator layer a distance d_1 from the emitter electrode; and
 - 5 (d) contacting the insulator layer and the collector layer, whereby electrons tunneling from the emitter electrode to the collector electrode and the emitter electrode thereby cooling the emitter electrode.
16. The method of claim 15 in which d_0 is in the range of 10 - 200Å.
- 10 17. The method of claim 15 in which d_1 is in the range of 5 - 50Å.
18. The method of claim 15 in which the insulator layer comprises a metal oxide.
19. The method of claim 18 in which the metal oxide is aluminum oxide.
20. The method of claim 15 in which the emitter electrode comprises a metal.
- 15 21. The method of claim 15 in which the collector electrode comprises a metal.